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THE PHYSIOLOGICAL SUPPORT OF THE PERCEPTIVE PROCESSES

THE problem which I propose is that of the relation between the processes upon which our perceptive elaborations and interpretations are built and their physiological basis or accompaniments. The usual view, often implied rather than expressed, is that the physiological adjustments take place primarily and tentatively; and that when they have brought in their verdicts, the data are then taken in hand and the mental interpretation built upon them. In the simpler processes, particularly in an undeveloped situation, sensory factors are dominant; and there may be very slight elaboration. This is characteristically true of animal perception and of the earlier stages of human mental life. It is also fairly true for all experimental stages in which there is little familiarity and the final issue is uncertain. In all these cases the dependence upon the physiological clues is probably close and direct; and the interpretation waits for the data to emerge and develop before it itself takes on a more definite form. On the other hand, in the case of expert and complex as well as familiar perceptions, it is urged that this relation is very decidedly different; and that this difference of status has been curiously overlooked in the standard descriptions as well as in experimental work concerning the relation of support between physiological clues and psychological results. It is the general law that our interest is in the issue, the result, and not in the process. Because of this principle there comes to be a science of psychology which has for its special purpose the detection and description of these relations that modify, while yet they evade conscious report. The principle also emphasizes that factors too slight or too suppressed to serve as the explicit basis of perception, none the less influence and even directly shape the conscious issue. What is meant by speaking of these factors as in their kinship physiological is often just this: that they serve their function in this suppressed or detached or embryonic manner, while yet they contribute to the determination of what emerges as a consciously matured perception.

To state the present thesis at once: it is maintained that in all elaborate perception the anticipatory effort, which seizes the issue as soon as there is the slightest chance to shape it, is dominant; and that the physiological processes act more to corroborate and reinforce the perception than actually to support or supply it. It is of course true that there must be some sort of physiological impression in order to serve as an actual sensory situation; and the contention is only that this is slight, that it acts merely as an index or clue, and that the clue serves to set off a prepared mechanism. This is equivalent

to saying that our perceptive processes are so much more dominantly psychological that the physiological aspect is suppressed, minimized, and at times disregarded.

The principle will be clear if presented in terms of the visual processes. It was through the study of these that doubt arose as to the validity of the ordinary statement—and a view developed that received an unexpected experimental confirmation. The situation in regard to vision is also peculiarly precise and definite in the case of the perception of distance. The physiological adjustment for distance is the accommodation-process in each eye, together with the convergence-process of the two eyes jointly, and also the important spacial relations on the two retinae. It is commonly said, and with substantial correctness, that the order of prominence of these three factors, despite some variability, is at least constant in this respect; that the motor processes of adjustment in terms of convergence represent the final stage of the physiological support; that suggestions or indications of distances possibly appear in an undeveloped situation in terms of the retinal relation, which at once pass over into the development of sharp and precise images (for which accommodation is necessary), the whole being then completed and matured by inducing the convergence-shiftings which effect and corroborate the inference of distance. All this appears convincingly in the ordinary stereoscopic view, particularly when it requires a slight adjustment. In this statement we leave out of account the secondary factors of light-and-shade and all the other aids to distance-perception, and confine attention to those factors which have a strong physiological support. In regard to this, the ordinary view then states that we accommodate and converge and coordinate; and when this has been done, there develops an estimate of distance which is then handed over to the perceptive process, which accepts it, refines it, and expresses it in such mental relations as suit the purpose of the situation. This description seems both inaccurate and irrelevant. In its place it is contended that the least possible physiological process is performed—just enough to get some suggestion of what the image may mean, and then at once the perceptive processes take up the situation; and the physiological processes come in merely to reenforce and support a conclusion to which they have contributed but very slightly. While thus the two views have something in common, in the main the principle thus stated is the exact reversal of the ordinary relation.

The experimental evidence was gathered in connection with the attempt to estimate absolutely and relatively the distance from the observer of minute points of light in a dark room. These points of light may be made to appear and disappear always in the same

line; and at times the observer was asked merely to estimate the distance of the point of light from his eye, and again, when two lights were exposed successively, to determine which was nearer and which farther. The estimates of different individuals were so entirely at variance that the conclusion was unmistakable that they were not due to physiological processes. The conclusion was equally obvious that in a situation like this, where the possibility of psychological development was withdrawn, the physiological support was almost helpless. It is important to explain that the conditions of these experiments were much more rigid than those usually employed, and that the rigidity of these conditions was made necessary because of the increasing conviction that the one thing which the eyes will not do, if they can avoid the burden, is to judge distance by physiological factors. In experimenting with slighter precautions, it was found that in one series of rather unusually correct visual judgments in the dark room, the result was due to an unconscious auditory perception,—the subject really gaining his estimate of distance according to the steps or the inferred position of the assistant who gave auditory clues as he walked from place to place to set the points of light. It was found, further (what is not unknown), that a slight glimmer of light in the dark room often completely changes the situation; and that it does so because this slight illumination enables the subject to see other portions of the room and thus to judge distance not in terms of accommodation and convergence, but of relative arrangement of objects in the room. Even in a bare room it was found that the floor-boards, the optical table, or any basis of support for the stimuli was enough to give a clue to the arrangement; and that as soon as such clue was available the physiological processes dropped to a wholly secondary position. Accordingly, in the final arrangements, the room is completely dark and neither the subject nor the assistant is at any time in the room. The assistant manipulates the apparatus by cords and pulleys in an adjoining alcove; and the subject is placed outside the room, viewing his spots of light through an opening in a screen ordinarily closed, but at the moment of observation exposed by a shutter. More than that, it was found highly desirable that the subject should never have entered the dark room, and if possible should be wholly ignorant of the size or nature of the space into which he is looking. It is not an unnecessary refinement to avoid these suggestions, to arrange that the subject be blindfolded before he enters the building and be taken by a devious way to a preliminary dark room where his eyes may be adjusted, and then led to his position without having any notion whatever of the depth or character of the space in which the points of light are to be exposed. While this

procedure may render the subject ill at ease in not quite knowing where he is, it is less objectionable than any definite knowledge of the situation. Under these circumstances points of light which actually were from five to twenty-five feet away may be judged to be as close as five feet and as far away as one hundred yards. It is found (although the experiments need to be repeated to be accepted as conclusive) that the most naïve subjects, when thrown wholly upon the physiological support, are so much at sea that their judgments are little more than guesswork.

It appears then that we are so accustomed to work on a psychological basis that when deprived of this basis our judgments are ill at ease, variable, uncertain, and irregular. Indeed, there is convincing evidence in some cases that the subject really forms a general impression of the probability that these lights are about as far off as they would be in a room of about the laboratory size, say fifteen to forty feet, and that this unconscious inference is still effective. The further proof of this relation was obtained by experimenting first with uninformed subjects and then allowing a glimmer of light to enter the room. This might be so slight that the subjects themselves did not distinctly perceive it, but it evidently gave them some suggestion of the arrangement and from then on their judgments of the spots of light were definite and accurate. These conclusions, which may be interpreted to mean that all sorts of suggestive factors which are psychological are far more important than physiological ones, is in a measure consistent. It was found, similarly, that it is far better, in determining the difference between monocular and binocular judgments, not to let the subject realize whether he is using one eye or two. It is better not to call attention to the physiological basis of a perception; and so there was devised a simple screen (which the subject does not see) which allows the assistant to determine whether the right or the left or both eyes shall make the judgment. The inference from these experiments, that a large number of the determinations that have been made to show the effect of convergence and accommodation may be quite erroneous, is clear; and it seems plausible that the very diverse results which different observers have found on this point are largely to be interpreted in terms of the psychological or subconscious suggestions which surround the experiment.

There are two corollaries from this position to which it is well briefly to call attention. The first is as to its applicability to other senses and perceptive processes. It will naturally be applicable in the main to the more inferential and elaborated sense-perceptions; but this view emphasizes the anticipatory factor in all perception. It tells us that we use our sense-impressions only to get clues of

situations and that this will be done whenever possible, although it provides for a very constant stream of reinforcements of this elaborated inference which we are so prone to make, by physiological tests. In the field of auditory perception there is not a great scope for the application of the principle outside of the more generic filling in of the sound impression. This falls outside of the present topic. Yet it is pertinent to refer to the fact that we guess a message through the telephone, if only we hear enough of the sounds with approximate accuracy so that we may make out the words. Yet symbolic interpretation of this kind and the filling in of gaps involve other factors than those here considered. In terms of auditory direction the principle has a limited application; we develop a perception of direction constantly and are uneasy in listening to sound in ignorance of its source. In locating a cricket in a room we always hear it *somewhere*, although the location changes its place and we are conscious of the illusory inference. And so there is a familiar stage-performance in which the artist appears with a violin and gives an acceptable rendition, while the bow is traveling across the strings. But before concluding the performance, he drops violin and bow, but the sounds continue and all the while have actually been due to a vocal imitation of the violin. Yet in all these cases the physiological support has not quite that direct relation to the inference of direction or source of origin that it has in the field of vision. There is a similar situation in the complex sensations that we get while eating. There again we are interested only in identifying the several articles of food placed upon the plate, for we are ill at ease if we do not know what it is we are eating. The esthetic effects of contrasts are at times suggestive. If we take up on the fork something that we have supposed to be potato but which proves to be butter, there is a moment of actual disgust. There is, at all events, an evidence of this tendency of slight physiological support to anticipate the sensation and then to use, as suggested, the data of the sensation to corroborate and reinforce the perception. These are mere analogies; and yet they have value in suggesting that the principle accurately applied in the visual perception of distance has an approximate or a transformed application elsewhere.

The other corollary is that it is owing to this principle that illusions are so common. From this arises a type of illusion which consists in ignoring the physiological support, in not observing that the psychological perception may be corrected by a more careful physiological reference. Whenever, in the perception of distance, one somehow gets the notion that the object is fifteen feet off, he continues to disregard the physiological messages which, if properly attended to, might tell him that the object was only five feet off. One

ignores with erroneous issue the physiological clues when the psychological inference is dominant and strong, and one tends to ignore them without such issue when they merely corroborate a correct perception. In the one case the perception overrides; in the other it almost dispenses with the support.

There is thus proposed an interpretation of the physiological support of a more complex and inferential perceptive process in what seems a more complete setting and a more correct perspective than is usually given; and from a practical point of view this attitude enforces the necessity for the most precise precautions to avoid psychological suggestion in determining physiological constants; and again it enforces a practical precept: that the introspective account of the simplest judgments should be carefully recorded in order to detect the processes by which the perceptive judgment is reached. It will not do to theoretically analyze the physiologically supporting processes and state their efficiency in terms uncomplicated by the psychological complexity in which all these are set; and all this is but an illustration of how essential it is to investigate psychologically as a whole what at first seems predominantly a physiological process.

JOSEPH JASTROW.

COLUMBIA UNIVERSITY.

DISCUSSION

A PROPOS D'UN ARTICLE DE MR. WALTER B. PITKIN
INTITULÉ: "JAMES AND BERGSON"

LE dernier numéro du JOURNAL OF PHILOSOPHY contient un article remarquablement clair et précis de Mr. Walter B. Pitkin intitulé "James and Bergson or, Who is against Intellect?" Mr. Pitkin, citant et interprétant un certain nombre de passages de mes travaux, en tire cette conclusion que la divergence est profonde entre les vues de M. le Professeur William James et les miennes, et que c'est à tort que l'auteur du "Pluralistic Universe" a cru que les deux doctrines pouvaient se prêter un mutuel appui. Plus particulièrement, M. Pitkin attaque l'interprétation que M. William James a donnée, dans son sixième chapitre, des vues que j'avais exposées sur les concepts, sur leur origine, leur portée et leur rôle. Comme je tiens, au contraire, l'interprétation de W. James pour parfaitement exacte, comme le chapitre qu'il a bien voulu me consacrer reproduit fidèlement ma pensée (en bien meilleurs termes, d'ailleurs que ceux dont je m'étais servi moi-même), je crois nécessaire de remettre les choses au point. Et je profiterai de l'occasion pour dire un mot des questions connexes que Mr. Pitkin soulève en passant.